



# FRD ACTIVITIES REPORT

## July - September 2016



### **RESEARCH PROGRAMS**

#### ***Project Sagebrush***

The four summer daytime tracer experiments of Phase 2 of Project Sagebrush (PSB2) were conducted between July 26 and August 5. These releases targeted light winds on sunny afternoons. Tracer was released for 2.5 hours and collected in bags at 10-minute averaging intervals. The sampling was done for a two hour period (12 bags per sampler) at four arcs located between 100 and 800 m from the source. The three closest arcs spanned an angle of  $210^\circ$  at  $6^\circ$  sampler spacing, whereas the 800 m arc was narrower. A mobile tower provided vertical tracer samples up to 25 m AGL. One fast response tracer analyzer was also deployed on each arc.

A preliminary summary of the meteorology during each of the four tests has been prepared. The analysis of the bag samples has been completed including the primary quality assurance and control procedures. Overall, predicting the average wind direction under daytime light wind conditions proved challenging even with the wide  $210^\circ$  sampling arcs. Even high-resolution numerical forecasts have difficulty forecasting wind directions under these conditions. Still, three of the four daytime experiments ended up providing useful tracer data, and even the fourth experiment may have limited periods of useful data.

Four nighttime releases are planned for October. The requisite number of bag sampling cartridges have been cleaned and prepared for these releases. These night experiments will use  $210^\circ$  sampling arcs at 100, 200, and 400 m from the source. Samplers that were on the 800 m arc during the summer experiments will instead be installed on four towers located on the 100 and 200 m arcs. On these towers they will provide additional vertical tracer measurements up to 12 m AGL in addition to the continued use of the mobile tower providing measurements up to 25 m AGL. Fast response tracer analyzers will again be deployed on each arc during the night tests.

The same extensive suite of meteorological instrumentation and measurements in place for the summer daytime experiments will also be used for the October nighttime experiments. This will be augmented with an additional five sonic anemometers and a ceilometer provided by Washington State University. The sonics will be arrayed at the surface at 3 m AGL across the tracer sampling array to evaluate spatial and temporal variability in the horizontal of the turbulence field in stable nighttime conditions. Two of the sonics will be collocated with an IRGA for measurement of water vapor and carbon dioxide fluxes. (All FRD staff)

#### ***Birch Creek Valley Wind Flow Study***

The manuscript "Evidence for gap flows in the Birch Creek Valley, Idaho" was accepted for publication in the Journal of the Atmospheric Sciences during the quarter. ([Dennis.Finn@noaa.gov](mailto:Dennis.Finn@noaa.gov))

## ***Wind Forecast Improvement Project (WFIP2)***

The WFIP2 site at Prineville, Oregon has continued to present a challenge due to rodents chewing underground cables. This site is likely the worst that has been encountered for this type of damage. To reduce the problem, conduit is being added to the most easily damaged cables, although protecting all the cables in this manner may not be feasible.

FRD is now starting to look at monthly biases between the observations at the two WFIP2 flux stations operated by FRD and forecasts provided by the High Resolution Rapid Refresh (HRRR) model. During the 2016 summer months, significant model biases have been observed with several variables, including outgoing shortwave and longwave radiation, daytime sensible heat flux, latent heat flux, and soil heat flux. Some of the biases are mainly at one station, and in some cases the biases in the standard HRRR 3 km model domain differ from what is seen with a special 750 m nested grid being run specifically for WFIP2. FRD is collaborating with ESRL to better understand the causes of these model biases. ([Matt.Brewer@noaa.gov](mailto:Matt.Brewer@noaa.gov), Rick Eckman, Kirk Clawson, Brad Reese, Shane Beard).

## ***London Fog***

A classified dispersion project took place on the Idaho National Laboratory in the September. The project, spearheaded by the John Hopkins University, has engaged the support of the ARLFRD as well as the broad logistics support of the INL. FRD is providing additional daily wind forecasts and discussions for the project. The project is expected to continue into October. ([Richard.Eckman@noaa.inel.gov](mailto:Richard.Eckman@noaa.inel.gov) and Jason Rich).

## ***MARS Methane***

A group of university researchers with the lead PI from Cornell University is planning to make measurements of methane on the Grid 3 sampling array in early October. This is part of an effort to develop algorithms for search patterns to identify and locate potentially naturally occurring methane emissions on Mars. Staff from the Field Research Division assisted with the logistical preparations for this effort during the quarter. ([Dennis.Finn@noaa.gov](mailto:Dennis.Finn@noaa.gov) and Kirk Clawson)

## ***Historical Tracer Studies***

The Field Research Division has been a principal participant in many tracer studies going back several decades. Unfortunately, results for many of these studies could not be readily utilized for analysis. Older studies frequently did not have electronic digital records with the only records now available being in hard copy form in various formats. An attempt was made to resuscitate as many of these older studies as was reasonably possible.

The experimental datasets from 12 field studies preceding Project Sagebrush have been consolidated into a database. These are in a form that would provide a basis for effective utilization and analysis. Reports are included for an additional 3 older field studies but the tracer data itself is not available in a convenient form. The database has been provided to the ARL HYSPLIT group for future model validation studies. ([Dennis.Finn@noaa.gov](mailto:Dennis.Finn@noaa.gov) and other staff)

## **NOAA/IDAHO NATIONAL LABORATORY (INL) METEOROLOGICAL RESEARCH PARTNERSHIP**

### ***NOAA/INL Mesonet***

Semiannual calibrations of all instruments in the NOAA/INL Mesonet were begun in late September. Completion of this process is expected sometime in November.

The no-cost lease agreement for the DUB (Dubois) mesonet station at the U.S. Sheep Experiment Station operated by the USDA expired at the end of September. At the request of the USSES, a cooperative agreement is being fashioned to accommodate the needs of the USDA. It is anticipated that the agreement will be signed sometime in the first quarter of FY17.

### ***Small Computing Cluster***

FRD has now obtained a small high-performance computing cluster from Silicon Mechanics. The cluster contains four compute nodes and a head node that serves as the user interface to the cluster. Overall, the system contains 192 logical cores (which is greater than physical cores due to hyperthreading), 320 GB of memory, and about 15 TB of storage. Some work was required to configure the cluster and set up the Message Passing Interface (MPI) libraries required to run parallel programs on the cluster. A rudimentary test of the cluster was conducted using a HYSPLIT run conducted during a recent drill at the INL Emergency Operations Center. The MPI version of HYSPLIT ran about ten times faster on the cluster than the serial version currently in use at FRD. This particular HYSPLIT run was fairly simple, so the maximum performance was already obtained using 16 cores. More complicated scenarios involving longer time periods and more radiological isotopes will be able to take advantage of more cores and should show an even greater speed-up compared to the serial version of the model. ([Richard.Eckman@noaa.gov](mailto:Richard.Eckman@noaa.gov), Shane Beard, Devin Clinger)

### ***Emergency Operations Center (EOC)***

Team C participated in a RWMC drill held at the EOC on 20 July. The drill centered on several ruptured drums containing radioactive material. Nowcasts and short term weather forecasts along with several HYSPLIT runs were produced during the drill. ([Dennis.Finn@noaa.gov](mailto:Dennis.Finn@noaa.gov))

Team B participated in a ATR Complex drill held at the EOC on 30 August. This particular drill centered on an earthquake that resulted in an airborne radioactive release. Nowcasts and short term weather forecasts were provided. A HYSPLIT plume was also produced during the drill. ([Matt.Brewer@noaa.gov](mailto:Matt.Brewer@noaa.gov)).

Team D participated in a RWMC drill on 14 September. This drill involved a building fire but no significant plume releases. Therefore, the NOAA support primarily consisted of providing short-term weather forecasts in case a release did occur. ([Richard.Eckman@noaa.gov](mailto:Richard.Eckman@noaa.gov))

### ***INL Hazardous Weather Alert System***

The NOAA INL Weather Center issued 6 hazardous weather alerts during the last quarter. Four of the alerts were issued for high winds and the 2 other alerts were issued for lightning. ([Jason.Rich@noaa.gov](mailto:Jason.Rich@noaa.gov) and other staff members).

## **OTHER ACTIVITIES**

### ***Safety***

At the August staff meeting, employees viewed a video about off road vehicle safety.

Danika M. Hughes, Security Specialist out of Seattle, WA conducted an Anti-Terrorism Risk Assessment Report for ARL/FRD on August 11. It was documented that no countermeasures are recommended at this time and ARL/FRD is in compliance with DOC and Interagency Security Committee (ISC) security standards.

### ***Travel***

Devin Clinger traveled to Dallas TX to attend Tower Climbing Safety and Rescue training, September 26-29.

Shane Beard traveled to various Oregon locations to complete maintenance and data collection for WFIP2, September 26-28.

### ***Training***

Donna Davis completed the required training to receive her certification for Contracting Officer's Representative (COR) on August 9.

All federal employees participated in required EEO training entitled "A Culture of Inclusion: Unconscious Bias in the Workplace" on September 13.

Devin Clinger completed the required Tower Climbing Safety and Rescue training.

### ***Miscellaneous***

In August, Devin Clinger started work at FRD as an employee of ERT Corp. He will be working as an electronics technician to help maintain the NOAA/INL Mesonet and support other FRD projects. We welcome Devin aboard.

On August 31, we bid farewell to Bill Behymer (again). Bill worked the past year at FRD as a half-time computer specialist employed by ERT Corp. We appreciate Bill's assistance and wish him a prosperous future.

We received a replacement GSA passenger van on September 7.